Results of a traditional ecological knowledge study on Arctic char in Qikiqtarjuaq (Nunavut) fishing areas

M. Y. Janjua, J. Etuangat, E. Sudlovenick, Z. Martin, R. F. Tallman, M. Friesen, T. Carmichael

Arctic Aquatic Research Division
Central and Arctic Region
Fisheries and Oceans Canada
501 University Crescent
Winnipeg, MB R3T 2N6

2016

Canadian Manuscript Report of Fisheries and Aquatic Sciences 3090

Fisheries and Oceans Canada | Pêches et Océans Canada

Canada

Canadian Manuscript Report of Fisheries and Aquatic Sciences

Manuscript reports contain scientific and technical information that contributes to existing knowledge but which deals with national or regional problems. Distribution is restricted to institutions or individuals located in particular regions of Canada. However, no restriction is placed on subject matter, and the series reflects the broad interests and policies of Fisheries and Oceans Canada namely, fisheries and aquatic sciences.

Manuscript reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in the database Aquatic Sciences and Fisheries Abstracts.

Manuscript reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page.

Numbers 1-900 in this series were issued as Manuscript Reports (Biological Series) of the Biological Board of Canada, and subsequent to 1937 when the name of the Board was changed by the Act of Parliament, as Manuscript Reports (Biological Series) of the Fisheries Research Board of Canada. Numbers 1426-1550 were issued as Department of Fisheries and Environment, Fisheries and Marine Service Manuscript Reports. The current series name was changed with report number 1551.

Rapport manuscrit canadien des sciences halieutiques et aquatiques

Les rapports manuscrits contiennent des renseignments scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui traitent de problèmes nationaux ou régionaux. La distribution en est limitée aux organisms et aux personnes de régions particulières du Canada. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques de Pêches et Oceans Canada, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports manuscrits peuvent être cités comme des publications à part entière. Le titre exact figure au-dessus du résumé de chaque rapport. Les rapports manuscrits sont résumés dans la base de données Resumes de sciences aquatiques et halieutiques.

Les rapports manuscrits sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre.

Les numéros 1 à 900 de cette série ont été publiés à titre de Manuscrits (série biologique) de l'Office de biologie du Canada, et après le changement de la designation de cet organisme par décret du Parlement, en 1937, ont été classes comme Manuscrits (série biologique) de l'Office des recherches sur les pêcheries du Canada. Les numéros 901 à 1425 ont été publiés à titre de Rapports manuscrits de l'Office de recherches sur les pêcheries du Canada. Les numéros 1429 à 1550 sont parus à titre de Rapports manuscrits du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établis lors de la parution du numéro 1551.

Canadian Manuscript Report of
Fisheries and Aquatic Sciences 3090

2016

RESULTS OF A TRADITIONAL ECOLOGICAL KNOWLEDGE STUDY ON ARCTIC CHAR IN QIKIQTARJUAQ (NUNAVUT) FISHING AREAS

by

M. Y. Janjua, J. Etuangat, E. Sudlovenick, Z. Martin, R. F. Tallman,
M. Friesen and T. Carmichael

Central and Arctic Region, Fisheries and Oceans Canada, 501 University Crescent,
Winnipeg, MB, R3T 2N6

© Her Majesty the Queen in Right of Canada, 2016.

Cat. No. Fs97-4/3090E-PDF ISBN 978-0-660-04462-0 ISSN 1488-5379

Correct citation for this publication is:
Janjua M. Y., Etuangat J., Sudlovenick E., Martin Z., Tallman R. F., Friesen M. and Carmichael T. 2016. Results from a traditional ecological knowledge study on Arctic char in Qikiqtarjuaq (Nunavut) fishing areas. Can. Manuscr. Rep. Fish. Aquat. Sci. 3090: 15 + vii p.

TABLE OF CONTENTS

	Page
ABSTRACT	vi
RÉSUMÉ	vii
1.0. INTRODUCTION	1
2.0. OBJECTIVES	1
2.1. STUDY AREA	2
3.0. METHODS	2
4.0. RESULTS AND DISCUSSION	2
4.1 PADDLE FIORD	2
4.2 NEDLUKSEAK LAKE SYSTEM	3
4.3 CONFERERATION FIORD	3
4.4 NUDLUNG FIORD	3
4.5. OTHER FISHING AREAS	3
5.0. CONCLUSION	4
6.0. ACKNOWLEDGEMENTS	4
7.0. REFERENCES	5

LIST OF FIGURES

Figure 1.	Map of the main Arctic char fishing areas used by the community of Qikiqtarjuaq, Broughton Island, Nunavut (Modified from Read 2000)	6

LIST OF TABLES

Table 1.	Information about the ten Qikiqtarjuaq community fishers who completed the Traditional Ecological Knowledge Survey 2014 and were interviewed as a follow-up to the survey responses.....	6
Table 2.	Summary of results from Traditional Ecological Knowledge Survey 2014 questions related to changes in Arctic char abundance and fish size in the Qikiqtarjuaq community fishing areas.....	6
Table 3.	Pooled responses (translated quotes) from the Traditional Knowledge Survey 2014.	8

LIST OF APPENDICES

Appendix I	The survey form used in 2014 for the Qikiqtarjuaq Traditional Ecological Knowledge study on Arctic char for the Qikiqtarjuaq community's fishing areas.	12
Appendix II	The consent form competed by the Qikiqtarjuaq community fishers for the Qikiqtarjuac Arctic char Traditional Knowledge Survey 2014.....	15

ABSTRACT

Janjua M. Y., Etuangat J., Sudlovenick E., Martin Z., Tallman R. F., Friesen M. and Carmichael T. 2016. Results from a traditional ecological knowledge study on Arctic char in Qikiqtarjuaq (Nunavut) fishing areas. Can. Manuscr. Rep. Fish. Aquat. Sci. 3090: 15 + vii p.

Qikiqtarjuaq, an island community on Broughton Island across from the northeast shore of Baffin Island, Nunavut, traditionally harvests Arctic char (*Salvelinus alpinus*) from adjacent lake and river systems. A traditional ecological knowledge (TEK) study was conducted in 2014 to consult community fishers and collect knowledge about the Arctic char harvested from those fishing areas with emphasis on changes that have occurred since the last TEK study conducted in 1995/1997. Information was collected from ten fishers who filled out a survey and then were interviewed. This will serve as basic information for proposing and designing scientific research work.

The four main areas fished were within or near Paddle Fiord, Nudlung Fiord, Nedluseak Fiord and Confederation Fiord. Paddle Fiord was the most popular fishing area regularly used for subsistence and commercial fishing. Survey respondents indicated Arctic char in this area were becoming healthier and increasing in abundance. However, Nudluit Lake (Nudlung Fiord) was noted as an area of concern because of observed drastic decreases in abundance. Other waterbodies varied in the health and abundance of Arctic char. Over the last 10 years a new population of Arctic char-like fish has been observed in the ocean surrounding Qikiqtarjuaq. Fishers regularly observed and caught other marine fish species they had not seen before.

Generally the respondents indicated that the present fishing areas are too small for the increasing number of fishers and that the Arctic char commercial quotas should be increased and new fishing areas opened. The respondents also indicated a need for separate quotas for waterbodies rather than for areas. The fishers would like Qikiqtarjuaq fishing areas to be added to DFO research plans and they wanted to be included in future Arctic char research projects.

RÉSUMÉ

Janjua M. Y., Etuangat J., Sudlovenick E., Martin Z., Tallman R. F., Friesen M. and Carmichael T. 2016. Reulsts from a traditional ecological knowledge study on Arctic char in Qikiqtarjuaq (Nunavut) fishing areas. Can. Manuscr. Rep. Fish. Aquat. Sci. 3090: 15 + vii p.

Qikiqtarjuaq, une communauté insulaire sur l'île Broughton en face de la rive nord-est de l'île de Baffin, au Nunavut, pêche traditionnellement l'omble chevalier (*Salvelinus alpinus*) dans les réseaux de lacs et rivières adjacents. Une étude sur le savoir écologiques traditionnel a été réalisée en 2014 afin de recueillir les connaissances des pêcheurs de la communauté sur l'omble chevalier récolté dans ces zones de pêche, en mettant l'accent sur les changements survenus depuis la dernière étude sur le savoir écologiques traditionnel conduite en 1995/1997. L'information a été recueillie auprès de dix pêcheurs qui ont répondu à un sondage, puis ont été interrogés. Cette étude servira de fondement pour concevoir et proposer des travaux de recherche scientifique.

Les quatre principales zones de pêche étaient situées à l'intérieur ou à proximité des fjords Paddle, Nudlung, Nedluseak et Confederation. Le fjord Paddle, régulièrement exploité pour la pêche de subsistance comme pour la pêche commerciale, est apparu comme la zone de pêche la plus fréquentée. Les répondants au sondage ont indiqué que l'omble chevalier dans cette zone était de plus en plus sain et abondant. Le lac Nudluit (Fiord Nudlung) est en revanche un sujet de préoccupation en raison du déclin drastique de l'abondance qui a été observé. La santé et l'abondance de l'omble chevalier dans les autres plans d'eau sont variables. Au cours des dix dernières années, une nouvelle population de poissons ressemblant à l'omble chevalier a été observée dans l'océan aux alentours de Qikiqtarjuaq. Les pêcheurs ont régulièrement remarqué et capturé d'autres espèces de poissons marins qu'ils n'avaient jamais vues auparavant.

Les répondants ont généralement indiqué que les zones de pêche actuelles étaient trop petites pour le nombre croissant de pêcheurs, que les quotas de pêche commerciale de l'omble chevalier devraient être augmentés et de nouveaux secteurs de pêche ouverts. Les répondants ont également mentionné qu'ils préféreraient des quotas par plan d'eau plutôt que par zone. Les pêcheurs souhaiteraient que les zones de pêche de Qikiqtarjuaq soient ajoutées aux plans de recherche de Pêches et Océans Canada et voudraient être intégrés aux futurs projets de recherche sur l'omble chevalier.

1.0. INTRODUCTION

Traditional Ecological Knowledge (TEK) can contribute to more effective management of natural resources (Gagnon and Berteaux 2009) and helps to form a more comprehensive image of a resource. When scientific research contains many uncertainties, other information sources such as TEK can provide additional information. Such types of knowledge help to improve the relationship between resource managers and resource users. It also helps to find common ground that allows complementary use of different types of knowledge and understanding of the complex environmental history of fish and fisheries in the study area (Hammit 2009). Traditional knowledge is recognized as very important in fisheries and needs to be combined with more formal assessments (Hipwell 1998). In data-deficient situations, such as many Nunavut fisheries, qualitative assessments based on TEK can be a good starting point.

Arctic char (*Salvelinus alpinus*) is highly valued by the community of Qikiqtarjuaq (also known as Qikiqtaakjuaq and formerly also called Broughton Island) for subsistence fishing and maintaining traditional lifestyles. There are also commercial and recreational fisheries in some areas. Qikiqtarjuaq is located on Broughton Island across from the northeast shore of Baffin Island, Nunavut. Compared to some other Arctic char fisheries in Nunavut, very few studies have been conducted on Qikiqtarjuaq fisheries (see Babaluk et al. 2010). A TEK survey was conducted in 1995-1997 along with collection of biological data (Read 2000). The knowledge shared was mostly related to fisheries related changes in Paddle Fiord, Natluksiak Lake and Nudluit Lake as well as possible reasons for the changes. Babaluk et al. (2010) reported results obtained from Arctic char sport fishing derbies (recreation fishery) held at Natluksiak (Nalusiaq) Lake in 2002 and 2004.

In December 2012, a community meeting was held with Nattivak Hunters and Trappers Organization (Nattivak HTO) in Qikiqtarjuaq, under the Aquatic Climate Change Adaptation Services Program (ACCASP), to discuss possibilities of further research on impacts of climate change on surrounding ecosystems. During the meeting, the community emphasized the need for new research on Arctic char in community fishing areas as they were observing many changes in recent times. Such changes in Arctic char abundance and ecology have been observed in other areas of Nunavut during recent years. Results from this study will be used to identify key issues and critical habitat for Arctic char and help focus scientific investigations. Additionally, this study will help to build on existing indigenous knowledge and expand the understanding of Arctic char fisheries in the Qikiqtarjuaq fishing areas.

2.0. OBJECTIVES

The objective of this TEK study was to consult the community of Qikiqtarjuaq and collect knowledge on Arctic char in local fishing areas with an emphasis on collecting information about any changes that have occurred during the last 15 years. As well, this study intended to document the community fishers' perspective on quotas, new proposed areas for commercial Arctic char fisheries as well as learn of other fisheries related issues.

2.1. STUDY AREA

Qikiqtarjuaq, home to 562 inhabitants, is an island community located on Broughton Island across from the northeast shore of Baffin Island along Davis Strait (Figure 1). It is close to the northern end of Auyuittuq National Park. The general vicinities of the main traditional fishing areas of the community fishers are, in order of most southerly to northerly, Paddle Fiord, Nedluseak Fiord, Confederation Fiord and Nudlung Fiord. Areas near or in Iqalugajut Fiord and North Pangnirtung Fiord are also fished. The area around Qikiqtarjuaq is inhabited by marine mammals such as walrus (*Odobenus rosmarus*), polar bear (*Ursus maritimus*), seal, narwhal (*Monodon monoceros*), beluga (*Delphinapterus leucas*) and occasionally bowhead whales (*Balaena mysticetus*).

3.0. METHODS

The study was conducted in May 2014 at Qikiqtarjuaq. Ten fishers, selected by the Nattivik HTO based on their diverse fishing experience, completed a survey (Appendix I) and were then interviewed as a follow up to the survey responses. All ten fishers completed a consent form (Appendix II). The fishers were chosen after a meeting with the community's Nattivak HTO, at which support and participation in a TEK study was requested. The survey addressed a range of topics including identification of the most frequented fishing areas, Arctic char abundance, fish size, fish diet, quality of the fish meat, habitat and spawning, with specific questions asking if any changes over time had been noticed. The survey also asked about ecosystem level and climate related changes. At a later time individual interviews with local fishers were conducted. Two Arctic College students (EJ and SE) interviewed the fishers based on the survey questions. Those interviewed included seven elders and three adults including one woman (Table 1). Those interviewed were encouraged to add to their own responses and to address other related issues. Topics were allowed to arise as naturally as possible.

4.0. RESULTS AND DISCUSSION

Results of the survey and interviews (Table 2 and 3) will be discussed according to the geographic areas fished from the most southerly (Paddle Fiord) to the most northerly area (Nudlung Fiord) (Figure 1). Most fishers reported Paddle Fiord as the primary fishing area with other main areas being in or near Nedlukseak, Confederation and Nudlung Fiords.

4.1. PADDLE FIORD

Paddle Fiord located approximately 75 km southeast of Qikiqtarjuaq remains the most fished area. It consists of several lakes along the Paddle River including Souvailik (Siurajuit) Lake (Read 2000), and is used for subsistence and commercial fishing. Most of the respondents reported that the Arctic char abundance had either increased or remained the same over the past 10 years while size of fish remained the same, and that the Arctic char were becoming healthier. Some fishers indicated that there are too many fishers for the small area and that other areas should be opened with new quotas. It was also requested that there be an increase in quota to avoid winter kill. A previous TEK survey in 1995/1997 found that the Paddle Fiord Arctic char population was stable (Read 2000). The mortality observed in the Paddle River in 2012-2013

was probably due to low water levels in the river causing it to narrow. In the 1980s the Paddle River was widened when it got narrow and slow, to allow the Arctic char to migrate back. The community fishers think this intervention may be necessary again.

4.2. THE NEDLUKSIAK LAKE SYSTEM

The Nedluksiak Lake system is located between Nedluseak Fiord and Okoa Bay, approximately 130 km northeast of the community of Qikiqtarjuaq. It is made up of a series of five small lakes located near Auyuittuq National Park. In Natluksiak (also known as Nalusiaq and Natluksiak) Lake, the Arctic char abundance either decreased or remained the same, while size of fish got smaller. In the 1995/1997 study, a trend in decreasing Arctic char population had been observed (Read 2000). There is also an important recreational fishery for the community in this area, especially in Nedluksiak (Nalusiaq) Lake in Auyuittuq National Park. In 2002 and 2004, Parks Canada, assisted by DFO, monitored the local recreational Arctic char fisheries held on the Nedluksiak (Nalusiaq) Lake system during a sport fishing derby to study the biological characteristics of the angled catch. They found an increase in catch-per-unit-effort (CPUE), and increases in fish mean size and age in 2004 compared to 2002 (Babaluk et al. 2010).

4.3. THE CONFEDERATION FIORD AREA

The Confederation Fiord area is located north of Nedluseak Fiord and consists of four main lakes: Ugallipaaq Lake, Qikiqtalik Lake, Akullipaaq Lake and Tasiujaq Lake. Arctic char were abundant in all four of these lakes. The respondents described that Confederation Fiord area had good populations of healthy Arctic char and that it is suitable for commercial fishing[1]. These lakes may have the potential to develop into a viable commercial fishery.

4.4. NUDLUNG FIORD

Nudlung Fiord, located approximately 180 km northwest of the community of Qikiqtarkjuaq is the most northern fishing area. Nudluit Lake is the main lake fished. The community fishers reported concern that the Arctic char abundance and size of fish both decreased in Nudluit Lake. They advised that Nudluit Lake should be closed for commercial fishing until the population recovers and stabilizes. The TEK survey in 1995/1997 also found that the number of fish and size of fish both were decreasing in Nudluit Lake. During the late 1980s and 1990s, the Nudlung Fiord area (outside of Auyuittuq National Park) was harvested commercially for Arctic char. Nudluit Lake has historically been a good fishing spot. This population was healthy in the 1970s but declined by the mid to late 1990s perhaps due to over-fishing and commercial fishing (Read 2000).

4.5. OTHER FISHING AREAS

Other fishing areas included Iqalugajut Fiord, Sarvalik Fiord and North Pangnirtung Fiord (Table 2 and 3). Arctic char were observed to be healthy in these areas. Overall, the community fishers indicated that the present fishing areas are too small for the increasing number of fishers in Qikiqtarjuaq. The community identified the Nedlukseak Fiord area and Sarvalik Lake as potential areas for new commercial fisheries.

[1] The Nattivak HTO in Qikiqtarjuaq requested and has been granted an exploratory quota of 2000 kg in the area.

Research needs include the identification of the fish species recently appearing in waters around Qikiqtarjuaq and determining their origin. Such big size char-like fish also have been reported from other marine areas of Nunavut e.g. Pangnirtung Fiord (unpublished discussions during the Ikaluit Lake, Regional Advisory Process (RAP) meeting held in Iqaluit, June 2014). The Qikiqtarjuaq community fishers have not noticed any major change in the Arctic char diet during last few years. The meat quality was good. Spawning was observed in the fall.

Changes in other fish species have occurred. Fishers regularly observed and caught other fish species they had not seen in the area in the last ten years. These species are suspected to be Atlantic herring (*Clupea harengus*), lumpfish (*Cyclopterus lumpus*) and redfish (*Sebastes mentella* or *Sebastes fasciatus*). Additionally, the fishers noted that there were more Atlantic salmon (*Salmo salar*) and capelin (*Mallotus villosus)* in the area compared to the past. Also, there is an observed decline in marine mammal populations with the exception of bearded seals (*Erignathus barbatus*) and polar bear. The ice free period is increasing in the area and at times the ice has appeared thinner than usual. In the past 15 years the fish have started to migrate down to the salt water earlier, and to migrate up to the freshwater later. This could be a reason for increased fall and winter mortalities in the fishing areas, especially Paddle Fiord. However, the fishers indicated that Arctic char is responding positively to the changes in the environment. It was stated that a proper fish plant was needed in Qikiqtarjuaq.

5.0. CONCLUSION

The 2014 TEK survey provided important information on the knowledge of the Qikiqtarjuaq fishers on Arctic char in their fishing areas. Since the last TEK survey in 1995/1997, many of the fishing areas remained the same and the abundance and size either remained the same or increased. However, there is concern that some areas are being over-fished e.g. Nudluit Lake. Other areas can support more fishing e.g. in the Paddle Fiord area. Decreased abundance was attributed to over-fishing, winter kill and changes in the climate. Generally the respondents indicated that the present fishing areas are too small for the increasing number of fishers and that the Arctic char commercial quotas should be increased and new fishing areas opened. The respondents also indicated a need for separate quotas for waterbodies rather than for areas. Fisheries research needs were identified for Arctic char as well as for other fish and marine mammals. The fishers would like Qikiqtarjuaq fishing areas to be added to DFO research plans and they want to be included in future Arctic char research and monitoring projects.

6.0 ACKNOWLEGEMENTS

This study was partially funded by Nunavut Wildlife Research Trust Project (NWRT) project grant number 3-13-24. We are thankful to Nattivak Hunters and Trappers Organization Qikiqtarjuaq and the community of Qikiqtarjuaq for their support and participation.

7.0. REFERENCES

Babaluk, J.A., Ohokannoak, J., Schlosser, K., Wastle, R.J., and Bajno, R. 2010. Arctic char, *Salvelinus alpinus*, sport fishery of Nalusiaq Lake, Auyuittuq National Park, Nunavut, May 2002 and 2004. Can. Manuscr. Rep. Fish. Aquat. Sci. 2933: ix + 69 p.

Hammitt, S. 2009. Collecting local knowledge about marine systems: a literature review. MIT-USGS Science Impact Collaborative, Massachusetts Institute of Technology Cambridge, MA.

Read, C.J. 2000. Information from Arctic charr fisheries in the Baffin Region, Nunavut, 1995 to 1999. Can. Data Rep. Fish. Aquat. Sci. 1067: x + 176 p.

Hipwell, B. 1998. Integrating local and traditional ecological knowledge into Fisheries Management in Canada. Final Report. Marine Ecosystem Conservation Branch, Fisheries and Oceans, Canada. http://www.dfo-mpo.gc.ca/Library/286379.pdf

Gagnon, C. A., and D. Berteaux. 2009. Integrating traditional ecological knowledge and ecological science: a question of scale. Ecology and Society 14(2): 19.

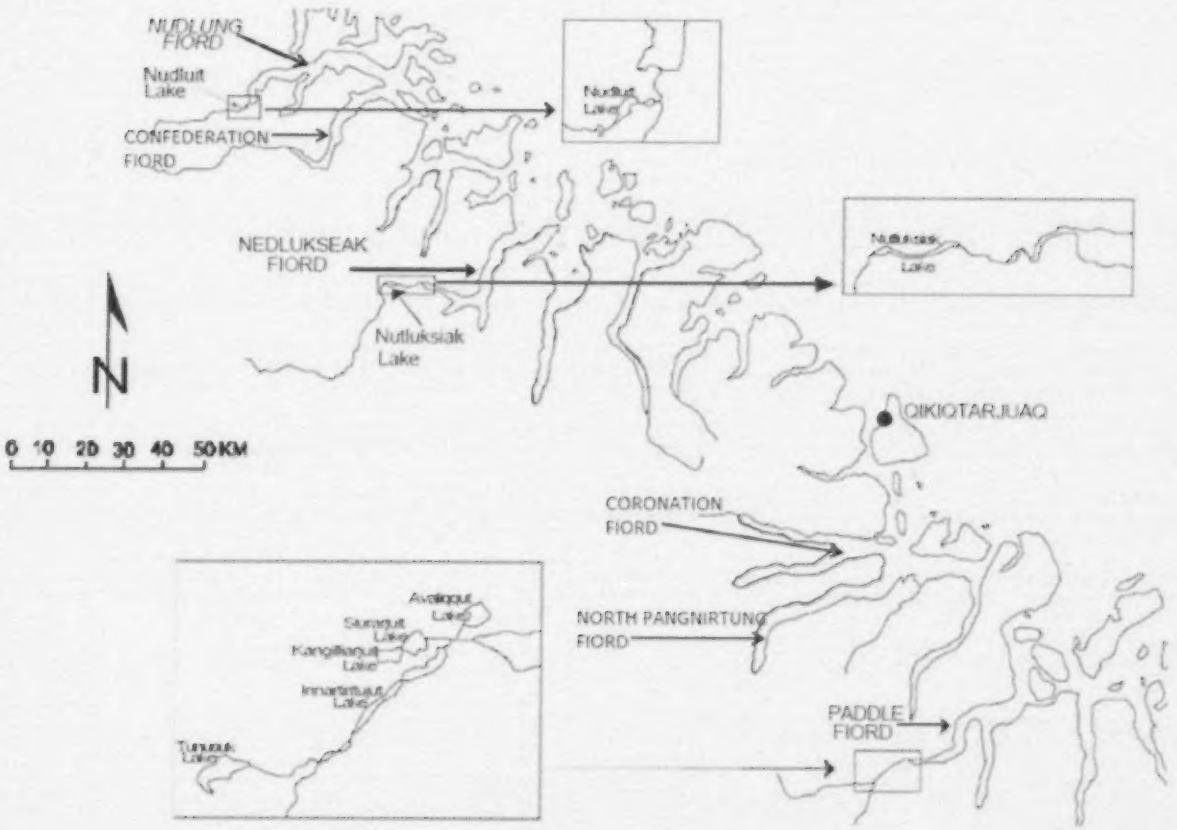

Figure1. Map of the main Arctic char fishing areas used by the community of Qikiqtarjuaq, Broughton Island, Nunavut ((Modified from Read 2000).

Table 1. Information about the ten Qikiqtarjuaq community fishers who completed the Traditional Knowledge Survey 2014 and were interviewed as a follow-up to the survey responses.

#	Name	Age Group	Fishing Since	Major Fishing area	Other Fishing area	Fishing Months
1	Aimo Kooneeliusie	Adult	All life	Nutluksiak	-	All year
2	Jacopie Newkingak	Elder	50 Y	Nudlung	Paddle	Winter
3	Gordie Audlakiak	Adult	All life	Paddle Fiord	-	Winter
4	Joanasie Kooneeliusie	Elder	50 Y	PaddleFiord	-	All year
5	Phillip Keeyootak	Adult	8 Y	Paddle (Tunsuk)	-	Winter
6	Leah Qummuatuk	Elder	All life	Sarvalik	Qammatalik/ Nedluseak	Spring/Winter
7	Leetia Kuksiak	Elder	long	Paddle Fiord	Nudluit/Nutluksiak	Spring/Winter
8	Juilie Kuksiak	Elder	20 Y	Paddle Fiord	-	All year
9	Johnny Keeyootak	Elder	35 Y	Paddle Fiord	Nedluseak /Sarvalik	Winter
10	Levi Nutaralak	Elder	50 Y	Paddle Fiord	Nedluseak	Winter/Summer

Table 2. Summary of results from the Traditional Knowledge Survey 2014 questions related to changes in Arctic char abundance and fish size in the Qikiqtarjuaq community fishing areas.

#	Fishing Area	Last Fished	Number of Fish	Size of Fish	Year of Change
1	Nudlung	2014	Decrease	Decrease	last 2-3 years
2	Nudlung/Nutluksiak	2014	Decrease	Decrease	50 years
3	Paddle /Nudlung	2014	No change	No change	No Answer
4	Nedlukiaq	No Answer	Increasing	No Answer	No Answer
5	Paddle (Avaliqqut/Kangilliarjuit)	2014	Decreasing	No Answer	No Answer
6	Sarvalik	2014	Increasing	Increasing	No Answer
7	Paddle Fiord	2014	Increasing	Increasing	4-5 years
8	Paddle Fiord	2014	increasing	Increasing	No Answer
9	Paddle Fiord	2014	No change	No change	No change
10	Nedluseak	2014	No Answer	Decreasing	No Answer

Table 3. Pooled responses (translated quotes) from the Traditional Ecological Knowledge Survey 2014.

1. ARCTIC CHAR FISHING AREAS

1.1 PADDLE FIORD

- Paddle Fiord is a very vast area and has a very good fish population.
- One can catch 100 fish in one night. There has never been a decrease in the fish population.
- This area is a good resource for fish in the start of snowmobiling season.
- The quota for the area should be increased and there should be some commercial fisheries.
- Paddle Fiord's fish have appeared to become healthier in colour.
- Tunusuq (Paddle Area Lake) has a healthy population with healthy char.
- Fish population in Qammatalik (in Paddle Area) is also increasing.
- Lakes are not getting as much fish compared to the past because the river is getting smaller.
- Fish is getting healthier in the areas where they were not healthy. Arctic char are getting healthier because unhealthy fish was fished out in the area.
- The meat is getting more reddish in colour, and size is also getting bigger compared to 4-5 years ago.
- In the summer there are Arctic char in the ocean in all the area between Sunshine Fiord and Paddle Fiord.
- Six lakes in Paddle Fiord have shared quotas and it may result in overfishing.
- Paddle River needs special attention because its size is decreasing and fish can't climb back. It was fixed in the past and need to be done again.
- There is large winter mortality because of thick ice during winter. Area and depth of rivers and lakes are decreasing. Fish should be fished in summer before they die.
- Last year, a lot of fish got frozen in the Paddle River. It was caused by the river getting smaller and the fish aren't able to get up to the lake.
- When a fisher opened up a hole in the river, a strong rotten smell came out.
- The river in Paddle Fiord seems to be deteriorating and it may be affecting the fish health.
- During winters, when a hole is opened in the lake ice, a rotten smell emerged. This might come from the fish that might have died out in the lake during the winter.
- Fish in Paddle lakes die off when they aren't fished out, considering the thickness of the ice.
- The fish in Paddle Lake seem to have more and more red spots on the skin and it also has something to do with the event in 2012 – 2013.

1.2 NEDLUKSEAK AREA

- No change in fish size and number is noticed in Nedlukseak area.
- Nedlukseak has a healthy population but with variable meat colour.

- There are too many fish in a small lake and they die because of overcrowding and suffocation.
- In the past fish died in the rivers of Nedlukseak due to over-crowding and under-fishing.

1.3 CONFEDERATION FIORD

- Confederation Fiord has a good population of healthy char and the area is suitable for commercial fishing.
- Arctic char in Confederation Fiord is healthy and in good abundance.
- Confederation Fiord Lakes has a wide variety of fish species. Some of them are not seen before.

1.4 NUDLUNG FIORD

- There has been change in the number of fish in the area especially in the Nudluit Lake.
- One can be very lucky to catch more than a few with nets. Catch-per-unit-effort (CPUE) has decreased from 30-40 fish per night to 2-10 fish per night.
- Fish size has decreased. For the last two years, fish is too small for sustainable fisheries.
- Commercial fishery is affecting two lakes.
- The area should be closed for commercial fishing until the population recovers.

1.5 OTHER FISHING AREAS

- Sarvalik Fiord also has very healthy fish population for commercial fisheries.
- Arctic char from this Sarvalik Lake can weigh up to 10-15 pounds.
- North Pangnirtung Fiord also has a healthy population where community like to fish in the early boating season.

2. ARCTIC CHAR DIET, SPAWNING

- Arctic char don't feed in the winter.
- No changes in diet have been noticed in recent years.
- Arctic char eat Kinguk (brine shrimp) as a main diet in the summer.
- Arctic char diet also includes cod, gastropods, and mosquitos (insects).
- Fish with eggs are observed in the fall. Fish usually go to the pebbly areas and disturb the bottom, fuzz it and drop their eggs. They like to sink their eggs under the pebbles.

3. COMMERCIAL FISHERIES AND QUOTAS

- There are more fishermen now and the commercial fishing area should be increased.
- Commercial fisheries are not allowed in smaller lakes and the fish just die off.
- DFO should do some research and explore the commercial fishing areas in Nudluit Lake.
- Fish abundance change every year. With full moon, number of fish decrease.
- Parks seems to be affecting the rivers. Fishing quotas are not allowed in these areas.

- At present, there is lump sum quota for each area. There should be separate quotas for each lake.
- There should be a proper fish plant at Qikitarqjuaq.

4. ECOSYSTEM

4.1 BIG CHAR-LIKE FISH

- There is a new fish population in the waters around Qikiqtarjuaq, and I suspect they are salt water fish.
- For the last 10 years, very large and healthy Arctic char have started to show up in the waters surrounding Qikiqtarjuaq in the summer season between June and September.
- They are red in color.
- These big char are not found in winter months in any fishing area.
- There is need to do research to find out where they are coming from.
- These fish might come from the Coronation Fiord at or near the Penny Ice Cap.
- We never have seen them in the lakes.

4.2 OTHER FISH

- There are also some unknown fish having spikes on the side with round short heads. They are big enough to get caught in the nets.
- There are also some other type of fish noticed in the summer in the Broughton channel. They are having the same colour as char. Their teeth also stuck out.
- Atlantic salmon and lump fish are coming in the area.
- Kavisilik (Atlantic herring) of 9-12 inch in size are also observed.
- Capelin are here since long but their numbers have increased during recent years.
- Kakilisak (ninespine stickleback) was common in Paddle Fiord area but are decreasing now.

4.3 OTHER ANIMALS

- There seems to be a decline on other animal populations, on the land and in water, except for the polar bears.
- Polar bear population is increasing.
- They move towards areas where there is no ice. Increase in ice free season is one of the reasons.
- Seal population is reducing near Qikiqtarjuaq and this year (2014-2015) there haven't been as many seals as usual.
- For the last two years, there is hardly any ringed seal (*Pusa hispida*) in the area. However, bearded seals population is increasing.
- Some seal wasting is also happening. It should be controlled.
- There are more killer whales and pilot whales. Bowhead whales are also increasing for the last 10 years.
- There are more and more geese and they are taking over the duck's territory.

5. CLIMATE CHANGE

- The ice on the lakes in Qikiqtarjuaq fishing areas has been fairly thin during the past 10 to 15 years.
- However, ice thickness changes yearly and this year (2014-2015) ice is really thick.
- The snow season also seems shorter.
- This year (2014-2015), the ice in the lake has started to melt earlier than usual.
- The lakes freezing time is also changing compared to recent past, and as a result, Arctic char movement between lakes and ocean is also changing. Nudlung
-
- In the past 15 years the fish have been migrating down earlier, and migrate up later. Fish is responding positively to the changes in the environment.

APPENDICES

Appendix I. The survey form used in 2014 for the Qikiqtarjuaq Traditional Ecological Knowledge study on Arctic char for the Qikiqtarjuaq community's fishing areas.

NWRT QIKIQTARJUAQ ARCTIC CHAR TRADITIONAL ECOLOGICL KNOWLEDGE SURVEY

Interview #: _____ Date: _____

Participant: _____ Interviewer: _____

Interview Time: _____

Gender: M F Age Group: Elder Adult Youth

Notes/Comments:

_____

_____

1- Where do you usually fish? (Mark locations on map)

Where	When (Months)	Number of days fished per year	Fishing in area since	Number of years fished	When last fished in that area

2- Have you noticed any changes in the Arctic char you catch?

Yes No

Where	Number of fish *Increase* *Decrease* *or Same*	Size of fish *Increase* *Decrease* *or Same*	Colour and taste of fish *Change* *or Same*	Year since you have noticed changes occurring

3- Do you have any idea what Arctic char eat? Have you observed any change in its feeding during recent years?

4- Have you noticed any other changes in the Arctic char?

5- Why do you think these changes are occurring?

6- Have you ever seen Arctic char fish ready to give eggs (egg fish?)

If yes Where? When?

7- Do you notice any change in Arctic char breeding during recent years?

8- Are there places that you usually see young char?

Where? When?

9- Are there any Arctic char fishing areas you consider important or sensitive for some reason? Why they are important?

10- Is there anything else you would like to say about Arctic char in your community/region?

11- What other types of fish did you see or catch? Where? At what time of year?

12- Do you think, the lakes/rivers ice free period has increased? During last 15 years

Increase Decrease No change

13- If increased how it is affecting your fishing and other activities?

Positively Negatively No effect

14- Have you notice any changes in the land, water, animals, or other fish in Arctic char fishing areas area?

15- Are there other people you know of that we should interview?

Appendix II. The consent form competed by the Qikiqtarjuaq community fishers for the Nunavut Wildlife Research Trust - Qikiqtarjuac Arctic char Traditional Knowledge Survey 2014.

CONSENT FORM FOR INDIVIDUAL INTERVIEWS

Project Title:
Community consultation and traditional knowledge studies on Arctic char in Qikiqtarjuaq fishing areas with emphasis on changes in during last 15 years.

NWRT Project Number: 3-13-24

Project Leader: Dr. Ross Tallman

Project Researcher: Muhammad Yamin Janjua, Zoya Martin

Organization:
Fisheries and Oceans Canada, Freshwater Institute, 501 University Cres., Winnipeg, MB, R3T 2N6, Ph: (204) 984-5541, Fax: (204) 984-2403, E-mail: Muhammad.Janjua@dfo-mpo.gc.ca

Project Objectives:
The objectives of this proposed research are to consult and collect traditional ecological knowledge (TEK) from Qikiqtarjuaq community on the Arctic char in adjacent community fishing areas with emphasis on changes that have occurred during the last 15 years and use this consultation and TEK information as base line information for proposing and designing further scientific research.

Medium of interview: Face to face using questioner and audio recording.

Consent to be interviewed and recorded:
I have been fully informed of the objectives of this study being conducted by the Fisheries and Oceans Canada (DFO) and partially funded by Nunavut Wildlife Research Trust. I understand these objectives and consent to being interviewed for this study. I understand that steps will be undertaken to ensure that this interview will remain confidential unless I consent to being identified. The data collected in this interview is the property of DFO and will be used to inform research within DFO. The information collected will be respected and used respectfully. A final report from these interviews will be sent directly to each participant.

I desire that my identity be non-confidential and that the information I provide be attributed to me.	
I desire that my identity and the information I provide be confidential.	

Name (please print): _____
Signature: _____
Date: _____